

CO0PE-B
COUNTER, FREQUENCY

1. GENERAL. This procurement requires a 0.1 Hz to 1.3 GHz, solid-state, universal electronic counter capable of IEEE 488-1978 digital bus operation.

2. CLASSIFICATION. Type II, Class 5, Style E, and Color R in accordance with MIL-T-28800 for shipboard applications.

3. MEASUREMENT REQUIREMENTS. The equipment shall be capable of frequency, period, period average, time interval, and ratio measurements as specified below.

3.1 Input characteristics. Three input channels shall be provided.

3.1.1 Input impedance. Channels A and B: selectable between nominal impedances of 1 megohm and 50 Ohms. Channel C: 50 ohms nominal.

3.1.2 Common input. Channels A and B shall have provisions for selection of common or separate inputs. When common input is selected, a signal applied to one channel shall be internally routed to both channels.

3.1.3 Attenuators. Channels A and B shall each be provided with selection of X1 and X10 attenuation.

3.1.4 Sensitivity. The channel C sensitivity shall be 15 mVrms or less from 100 MHz to 1 GHz. The channels A and B sensitivity shall be as follows:

- a. 25 mVrms or less up to 35 MHz.
- b. 50 mVrms or less from 35 MHz to 100 MHz.
- c. 150 mV peak-to-peak or less for pulse measurement.

3.1.5 Damage level. See table I.

TABLE I. Damage Level.

<u>Channel</u>	<u>Attenuator Setting</u>	<u>Frequency Range</u>	<u>Input Voltage</u>
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A and B 1 megohm	X1	0 to 3.5 kHz	200V (dc + peak ac)
		3.5 to 100 kHz	$\frac{5 \times 10^5 \text{ Vrms}}{\text{Hz}}$
		100 kHz to 100 MHz	5 Vrms
A and B 1 megohm	X10	0 to 35 kHz	200V (dc + peak ac)
		35 kHz to 1 MHz	$\frac{5 \times 10^6 \text{ Vrms}}{\text{Hz}}$
		1 to 100 MHz	50 Vrms
A and B 50 Ohms	any	entire	5 Vrms
C	X1	100 MHz to 1.3 GHz	5 Vrms

3.1.6 Protection. Channel C input shall be protected from input overloads. Protective devices designed to permanently open the circuit to comply with this requirement shall be replaceable from the front panel.

3.1.7 Coupling. Channels A and B: ac and dc. Channel C: ac.

3.1.8 Triggering.

3.1.8.1 Trigger slope. Channels A and B shall have independent selection of triggering for both the positive and negative slopes of the input signal.

3.1.8.2 Trigger level. Channels A and B shall have independent selection of any trigger level $\pm 2.5V$ times the attenuator setting. Additionally, it shall be possible to set Channel A and B trigger levels in percent of peak signal amplitude. The default trigger level shall be 50%. Channel C triggering shall occur at 0V nominal. An indication of the trigger points shall be provided for channels A and B.

3.1.8.3 Trigger error. The maximum allowable trigger error shall be less than 2 times the peak noise voltage divided by the signal slew rate (in volts/second).

3.1.9 Arming. Operator arming capability shall be provided for any measurement. When arming is activated, the measurement channel (A, B, or C) shall be allowed to initiate the measurement only upon application of an arming signal to the arm input. Removal of the arming signal shall not hinder the measurement in progress.

3.2 Frequency characteristics. The equipment shall automatically measure and directly indicate the signal frequency. The equipment shall properly measure sine wave and pulse signals that have a pulse width of at least 5 ns for channels A and B and at least 500 ps for channel C. The frequency composing a burst signal when the burst length is at least 11 ms for channels A, B, and C shall be directly measurable with no other signal connections to the counter necessary.

3.2.1 Frequency range. Channels A and B: 0.1 Hz to 100 MHz. Channel C: 100 MHz to 1.3 GHz.

3.2.2 Frequency accuracy. \pm resolution \pm time base error x frequency.

3.2.3 Frequency resolution. 0.1 Hz to 1 MHz.

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3.3 Time interval characteristics. The equipment shall measure and directly indicate the time interval between signals.

3.3.1 Time interval range. 0.1 us to 1,000s.

3.3.2 Pulse width. 25 ns minimum.

3.3.3 Time interval accuracy. \pm resolution \pm time base error \pm trigger timing error.

3.3.4 Time interval resolution. 10 ns to 1s.

3.4 Time interval average or high resolution characteristics. The equipment shall provide increased resolution for time interval measurements. Averaging may be used to achieve time resolution.

3.5 Period characteristics. The equipment shall measure and directly indicate the period and the period average of signals.

3.5.1 Period range. 10 ns to 10s.

3.5.2 Period accuracy. The period measurement accuracy shall be within \pm (time base error + resolution) x the period.

3.5.3 Period resolution. The period resolution shall be from 10 ns to 1s for a single period and 1 ps to 100 ns for period averaging.

3.6 Ratio characteristics. The equipment shall measure and directly indicate the ratio and ratio average of two signals below identified as f1 and f2 where f1 is the signal applied to the decimal counters through channel B and f2 is the frequency used as a gating signal through channel A.

3.6.1 Ratio range. 1 Hz to 100 MHz.

3.6.2 Ratio accuracy. \pm (least significant digit + B trigger error/gate time) x the ratio.

3.7 Display.

3.7.1 Measurement units. MHz, Hz, s, and us.

3.8 Gate lamp. A front-panel display device shall indicate gate operation.

3.9 Hold. The equipment shall provide a means of holding the displayed reading indefinitely.

3.10 Reset. A manual reset control that initiates a new measurement cycle shall be provided.

3.11 Self-check. A self-check function that verifies operation of the frequency measurement mode shall be provided.

3.12 Time base. Frequency: 10 MHz.

3.12.1 Aging rate. $\pm 5 \times 10^{-10}$ /day after a 24-hour stabilization period.

3.12.2 Oscillator adjustment range. ± 10 Hz.

3.12.3 External standard input. The equipment shall be capable of operation from an external 10 MHz frequency standard with an amplitude of 1 Vrms into 50 ohms.

3.13 Output. The equipment shall be provided with a 10 MHz standard frequency output.

4. GENERAL REQUIREMENTS.

4.1 Power source. MIL-T-28800 nominal power source requirements are invoked. Maximum power consumption: 150W.

4.1.1 Time-base power. The equipment shall be provided with a power control position wherein only the time base oscillator and oven are energized.

4.2 Weight. 20 kg (44 lb) maximum.

4.3 Digital interface. Digital interface in accordance with MIL-T-28800.

4.4 Lithium batteries. Per MIL-T-28800, lithium batteries are prohibited without prior authorization. A request for approval for the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.